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EXAMINER	
BRINEY III, WALTER F	
ART UNIT	**PAPER NUMBER**
2615	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/557,533	BLAMEY ET AL.	
	Examiner	Art Unit	
	Walter F. Briney III	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,9,10,12-15,17-20,24-26,28 and 30* is/are rejected.

7)☒ Claim(s) *6-8,11,16,21-23,27 and 29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/25/06 and 11/21/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. **Claims 1 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Kurtz et al. (US Patent 6,914,979).**

Claim 1 is limited to "a method of identifying oscillation in a signal due to feedback." In rejecting this claim, the examiner notes the disclosure of Kurtz, which is directed towards tone detection. See Abstract. The detection algorithm of Kurtz includes computing a Discrete Fourier Transform (DFT) on a group of N samples. See column 2, lines 21-26. The DFT corresponds to "converting the signal at each of a series of successive time windows into the frequency domain" where the group of N samples corresponds to a "time window." Following the DFT computation, the method of Kurtz determines the change in phase according to the formula shown in column 2, line 55. This corresponds to "calculating...the change in signal phase from a time window to a subsequent time window." Kurtz discloses performing said phase change calculation for the two highest power tones, i.e. "for each of a plurality of frequency bands." See column 2, lines 37-40. The signal phase change information is then compared to an expected phase change to determine a phase deviation, which

determines if an oscillation is present. See column 2, line 56. The expected phase change corresponds to "one or more defined criteria" while the comparison step corresponds to "comparing, for some or all of said frequency bands, the results of the calculation step to one or more defined criteria to provide a measure of whether oscillation due to feedback is present in the signal." With respect to the preamble, it is submitted that because the method steps recited in this claim are disclosed by a prior art teaching that is directed toward identifying oscillation in a signal not due to feedback but due to a DTMF source and because the body of the claim fails to establish the source of feedback, the limitation "due to feedback" is not further limiting of the claim. Therefore, Kurtz anticipates all limitations of the claim.

Claim 18 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 1, which are anticipated by Kurtz. Therefore, Kurtz anticipates all limitations of the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 3 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurtz.

Claim 3 is limited to "the method of claim 1," as covered by Kurtz. It is noted that Kurtz discloses performing a Discrete Fourier Transform. This necessarily fails to meet

the limitation "in which the step of signal conversion in to the frequency domain is carried out by way of a Fast Fourier Transform technique." However, one of ordinary skill in the art would immediately recognize the opportunity to improve the invention of Kurtz by making use of the so-called FFT.

The examiner takes Official Notice of the fact that the FFT was derived prior to the applicant's invention to replace the cumbersome process of calculating DFT coefficients explicitly with a complexity of $2\ N^2$ with a more streamlined algorithm of complexity $2\ N \log_2 N$. It would have been obvious to one of ordinary skill in the art at the time of the invention to calculate a DFT with the FFT algorithm as was known in the art for the purpose of reducing computational complexity.

Claim 20 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 3, which are anticipated by Kurtz. Therefore, Kurtz anticipates all limitations of the claim.

3. Claims 2, 9, 10, 19, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurtz in view of Bartkowiak (US Patent 6,587,559).

Claim 2 is limited to "the method of claim 1," as covered by Kurtz. While Kurtz nominally discloses performing energy threshold tests for each frequency, this does not anticipate "the step of further calculating, for each of the frequency bands, the change in signal amplitude from a time window to a subsequent time window, and comparing the result of the further calculation step to one or more further defined criteria, to provide a further measure as to whether oscillation due to feedback is present in the signal." As

will be shown below however, this difference is the result of an obvious modification to the teachings of Kurtz.

In particular, Bartkowiak identifies the deficiency in the prior art of using simple thresholding tests. See column 3, lines 7-15. In solution, Bartkowiak sets forth in figure 4 a plurality of energy tests, including a step (205) in which a difference of energy between frames is calculated.

It would have been obvious to one of ordinary skill in the art at the time of the invention to perform energy difference measurements as taught by Bartkowiak at least because Kurtz fails to identify a preferred method for energy measurement and because Bartkowiak identifies that simple thresholding tests are not sufficiently resistant to noise.

Claim 19 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 2, which are obvious over Kurtz in view of Bartkowiak. Therefore, Kurtz in view of Bartkowiak makes obvious all limitations of the claim.

Claim 9 is limited to "the method of claim 2," as covered by Kurtz in view of Bartkowiak. As described in the rejection of claim 2, a difference in powers is detected in accordance with step (205) of Bartkowiak. This corresponds to "for each time window the amplitude from at least one previous window is compared with that of the current window to calculate a change in amplitude." Therefore, Kurtz in view of Bartkowiak makes obvious all limitations of the claim.

Claim 24 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 9, which are obvious over Kurtz in view of

Bartkowiak. Therefore, Kurtz in view of Bartkowiak makes obvious all limitations of the claim.

Claim 10 is limited to "the method of claim 9," as covered by Kurtz in view of Bartkowiak. Kurtz discloses incrementing a counter HCNT each time a DTMF tone is detected in a window. See column 5, line 33, through column 6, line 51. That is, each time all DTMF tone validating requirements are met, HCNT is incremented closer towards the value MINHC. In addition, when the difference taken at step (205) of Bartkowiak evaluates to a number greater than zero, a tone will be detected in accordance with steps 210-290 excluding steps 220, 230, 240 and 285. It follows that when the energy threshold measurements of Kurtz are replaced with those taught by Bartkowiak, the counter HCNT is incremented when the difference determined in step (205) of Bartkowiak evaluates to a number greater than zero. However, when the change is not greater than zero, the method of Bartkowiak proceeds to step 240, resulting in a reset of detection. This corresponds to "the counter being reset if it is not." The value "M_a" as recited corresponds to MINHC. Therefore, Kurtz in view of Bartkowiak makes obvious all limitations of the claim.

Claim 25 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 10, which are obvious over Kurtz in view of Bartkowiak. Therefore, Kurtz in view of Bartkowiak makes obvious all limitations of the claim.

4. Claims 1, 4, 5, 12, 14, 17, 18, 26 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weidner (US Patent 6,404,895) in view of Kurtz.

Claim 1 is limited to "a method of identifying oscillation in a signal due to feedback." In rejecting this claim the examiner notes the disclosure of Weidner, which is directed towards a method for feedback recognition in a hearing aid and a hearing aid operating according to the method. See Abstract. Weidner mainly teaches detecting feedback using attenuation measurements, as set forth in column 1, lines 51-64. However, Weidner discloses in column 2, lines 62-64, using an oscillation detector in addition to the attenuation-based feedback detector. In this way, Weidner discloses that the hearing aid disclosed "detects oscillations due to feedback." It is noted that Weidner alone fails to anticipate all limitations of the claim, specifically the "converting," the "calculating" and the "comparing" steps, however, it will be shown below that these steps are the result of obvious modifications to the teachings of Weidner.

In particular, recall that Weidner disclosed using an oscillation detector in addition to the attenuation measurements set forth in column 1, lines 51-64. Weidner's lack of an explicit preferred oscillation detection scheme motivates one of ordinary skill in the art to use a known oscillation detection algorithm, such as the one taught by Kurtz. The detection algorithm of Kurtz includes computing a Discrete Fourier Transform (DFT) on a group of N samples. See column 2, lines 21-26. The DFT corresponds to "converting the signal at each of a series of successive time windows into the frequency domain" where the group of N samples corresponds to a "time window." Following the DFT computation, the method of Kurtz determines the change in phase according to the formula shown in column 2, line 55. This corresponds to "calculating...the change in signal phase from a time window to a subsequent time

window." In combination with the disclosure of Weidner, the phase change calculation should be performed for each frequency band B that is to be tested, i.e. "for each of a plurality of frequency bands." The signal phase change information is then compared to an expected phase change to determine a phase deviation, which determines if an oscillation is present. The expected phase change corresponds to one or more defined criteria" while the comparison step corresponds to "comparing, for some or all of said frequency bands, the results of the calculation step to one or more defined criteria to provide a measure of whether oscillation due to feedback is present in the signal."

It would have been obvious to one of ordinary skill in the art at the time of the invention to perform oscillation detection using the phase change algorithm as taught by Kurtz for the purpose of providing a detection result that is substantially immune to noise based on its use of a time window including a plurality of samples and because Weidner simply fails to provide a preferred method of oscillation detection.

Claim 18 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 1, which are obvious over Weidner in view of Kurtz. Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 4 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. Weidner indicates that the entire transmission range of the hearing aid is monitored for feedback, and that detection occurs in pass bands ranging in size between 100 Hz and 2KHz. See column 1, line 65, through column 2, lines 2 and 16-23. Despite this disclosure, neither Weidner nor Kurtz specifically discloses monitoring 64 frequencies. As will be shown, this difference between the cited prior art and the

claimed invention is the result of an obvious modification to the teachings of Weidner in view of Kurtz.

As a design choice, consider a hearing aid with an operating range of 6400 Hz, with monitoring bands of 100 Hz as set forth in column 2 of Weidner. In this example, the invention of Weidner is directed toward monitoring 64 frequencies for feedback, i.e. "the number of frequency bands is around 64." As the applicant has not specifically indicated why monitoring 64 bands is beneficial, it follows that it would have been obvious to one of ordinary skill in the art to design a hearing aid with an operating range of 6400 Hz, with monitoring bands of width 100 Hz, resulting in 64 monitoring bands simply through design choice. Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 5 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. When the system disclosed by Weidner monitors 64 frequency bands as set forth in the rejection of claim 4, the FFT computed by Kurtz requires a time window of length $[(6400 * 2 \text{ samples/second}) / 64 \text{ samples}]^{-1} = 5$ ms. Clearly, 5 ms falls within the range of "1 ms to 100 ms" recited. Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 12 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. Weidner discloses eliminating feedback when oscillation is detected. See column 1, lines 57-64. The suitable countermeasures that are undertaken correspond to "a selected method for suppressing oscillation." More specifically, attenuation may be provided only in the frequency range where oscillation is detected. See column 5,

lines 21-26. Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 26 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 12, which are obvious over Weidner in view of Kurtz. Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 14 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. As set forth in the rejection of claim 12, Weidner discloses removing feedback by removing a particular frequency component, i.e. "applying a notch filter." Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 17 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. The hearing aid of Weidner includes "settable signal gain values," such as those for amplifier 12a being set by control unit 26. Moreover, column 3, lines 1-10, discloses that attenuation is the main countermeasure to feedback and should be used upon detecting feedback. Column 4, line 66, through column 5, line 3, indicate that attenuation can be provided by an acoustician during hearing aid fitting upon automatic detection of feedback—i.e., "comparing calculating and comparing are carried out as part of a setup phase in order to set or adjust said gain values." Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

Claim 30 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 17, which are obvious over Weidner in view of Kurtz. Therefore, Weidner in view of Kurtz makes obvious all limitations of the claim.

5. **Claim 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Weidner in view of Kurtz and further in view of Stepp et al. (US Patent 4,449,237).**

Claim 13 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. Weidner discloses phase shifting upon the detection of oscillation due to feedback. However, Weidner does not disclose applying a "random phase." As will be shown however, known phase shifters for use in removing feedback are known to do so using random phase.

Specifically, Stepp teaches an audio feedback suppressor that generates a pseudo-random code at the output of block (25) that is transformed by a voltage controlled oscillator (26) into a random delay control signal, which in turn generates a random time delay, i.e. "random phase," by way of delay device (21). See the lone figure and column 3, lines 24-47.

It would have been obvious to one of ordinary skill in the art at the time of the invention to implement a phase shifter according to the teachings of Stepp simply because Weidner fails to disclose a preferred phase shifting means and because random phase shifting does not have the debilitating effects on sound quality as fixed delay lines as set forth in the Background Art section of Stepp.

6. **Claims 15 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weidner in view of Kurtz and further in view of Stepp et al. (US Patent 4,449,237).**

Claim 15 is limited to "the method of claim 1," as covered by Weidner in view of Kurtz. The hearing aid of Weidner includes a non-linear amplifier 20, which means its gain varies as a function of the input signal's amplitude. See column 3, lines 47-51.

This means the amplifier 20 derives "gain values for said frequency bands (by wideband amplification) in accordance with a specified signal processing algorithm." Yet neither Weidner nor Kurtz disclose, teach or suggest comparing, for some or all of said frequency bands, the derived gain with a prescribed gain limit in order to provide a further measure as to whether oscillation due to feedback is present in the signal. However, the prior art teaches the benefits in doing so.

In particular, Luo teaches an adaptive feedback canceller that uses a plurality of signal measurements in each of a plurality of feedback detectors, each associated with one bandpass frequency, to detect feedback. The stated advantage is found in paragraph [0055]: "The inventors have found that combining two or more of the parameters results in more reliable detection of potential feedback...using all possible parameters together results in a more reliable and a rapid suppression or prevention of feedback." One such measured parameter outlined in paragraph [0054] is determining a gain differential. Gain applied to a bandpass signal is compared to a maximum gain—i.e., "a prescribed gain limit"—to determine whether feedback is present.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the hearing aid of Weidner to include the further measure of comparing derived gain to a prescribed gain limit as taught by Luo for the purpose of providing more reliable detection of potential feedback as well as more rapid suppression of feedback.

Claim 28 recites an apparatus comprising means that are inherently necessitated by the method steps of claim 15, which are obvious over Weidner in view

of Kurtz and further in view of Luo. Therefore, Weidner in view of Kurtz and further in view of Luo makes obvious all limitations of the claim.

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject matter:

7. **Claims 6-8, 11, 16, 21-23, 27 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.**

Claim 6 is limited to "the method of claim 1," as covered by either Weidner in view of Kurtz or by Kurtz alone. In both rejections of claim 1, the examiner relied upon Kurtz for teaching the step of determining a phase difference and then comparing that phase difference to an expected value, where the expected value is a preset value. In this way, Kurtz fails to teach the use of "a previous phase change" to provide a measure of the change in phase change. Thus, claim 6 is allowable over both Weidner in view of Kurtz and over Kurtz alone.

Claims 7 and 8 are limited to "the method of claim 6," and are allowable over the cited prior art for at least the same reasons.

Claim 11 is limited to "the method of claim 10," as covered by Kurtz in view of Bartkowiak. While Kurtz discloses a second counter MCNT, this second counter is not incremented when the value of the change in phase change is within a prescribed limit. Rather, MCNT is a miss count and is incremented when the converse detection condition applies, i.e. when the phase change is not within a prescribed limit. See

column 5, line 33, through column 6, line 51. Thus, claim 11 is allowable over Kurtz in view of Bartkowiak.

Claim 16 is limited to "the method of claim 15," as covered by Weidner in view of Kurtz and further in view of Luo. Quite simply, Weidner, Kurtz and Luo fail to disclose, teach or suggest selectively comparing a derived gain to a prescribed gain limit. Thus, claim 16 is allowable over the cited prior art.

Claim 29 recites an apparatus according to claim 28 comprising means that are inherently necessitated by the method steps of claim 16, which are allowable over both Weidner in view of Kurtz and over Kurtz alone. Thus, claim 29 is allowable over both Weidner in view of Kurtz and over Kurtz alone.

Claim 21 recites an apparatus according to claim 15 comprising means that are inherently necessitated by the method steps of claim 6, which are allowable over both Weidner in view of Kurtz and over Kurtz alone. Thus, claim 21 is allowable over both Weidner in view of Kurtz and over Kurtz alone.

Claims 22 and 23 are limited to "the apparatus of claim 21," and are allowable over the cited prior art for at least the same reasons.

Claim 27 is limited to "the apparatus of claim 18," as covered by either Weidner in view of Kurtz or as covered by Kurtz alone. Neither rejections set forth above use the analyzed signal, i.e. the signal used to detect oscillations, as the output signal. Rather, both Weidner and Kurtz appear to perform detection in parallel. The disclosure of Weidner evidences this by placing the detection circuitry in parallel with the output path 'Y'. The disclosure of Kurtz evidences this deficiency by not even providing a

description or depiction of a waveform output. Thus, claim 27 is allowable over both Weidner in view of Kurtz and over Kurtz alone.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter F. Briney III whose telephone number is 571-272-7513. The examiner can normally be reached on M-F 8am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sinh Tran can be reached on 571-272-7564. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SINH TRAN
SUPERVISORY PATENT EXAMINER

wfb
4/12/07